

as references as they are.

What is Claimed is:

[Claim 1] A UWB transmitter comprising:

an echo detector for detecting the polarity of an echo at the position of the second chip period that is shorter than the first chip period which is the original chip period in advance; and

a pulse generator for generating a pulse at the second chip period when generating a pulse of the same polarity as that of the immediately preceding pulse and generating a pulse at the first chip period when generating a pulse of the inverse polarity to that of the immediately preceding pulse where the echo detected by said echo detector has the same polarity, and for generating a pulse at the first chip period when generating a pulse of the same polarity as that of the immediately preceding pulse and generating a pulse at the second chip period when generating a pulse of the inverse polarity to that of the immediately preceding pulse where the echo detected by said echo detector has the inverse polarity.

[Claim 2] The UWB transmitter as set forth in Claim 1, wherein the second chip period is $1/2$ of the first chip period.

[Claim 3] The UWB transmitter as set forth in Claim 1

or 2, wherein said echo detector operates as a correlator for decoding codes in a receiver.

[Claim 4] A UWB receiver comprising:

an echo detector for detecting the polarity of an echo at the position of the second chip period that is shorter than the first chip period which is the original chip period in advance;

a pulse generator for generating a pulse at the second chip period when generating a pulse of the same polarity as that of the immediately preceding pulse and generating a pulse at the first chip period when generating a pulse of the inverse polarity to that of the immediately preceding pulse where the echo detected by said echo detector has the same polarity, and for generating a pulse at the first chip period when generating a pulse of the same polarity as that of the immediately preceding pulse and generating a pulse at the second chip period when generating a pulse of the inverse polarity to that of the immediately preceding pulse where the echo detected by said echo detector has the inverse polarity; and

a correlator for correlating a pulse train from said pulse generator and a received signal.

[Claim 5] The UWB receiver as set forth in Claim 4, wherein the second chip period is $1/2$ of the first chip period.

[Claim 6] The UWB receiver as set forth in Claim 4 or 5, wherein said echo detector operates as said correlator too.